

specification. The Applicant respectfully requests reconsideration of the rejection.

By the Office Action, claim 24 stands rejected under 35 U.S.C. 112, second paragraph. Claim 24 has been amended in a way believed to overcome this rejection.

By the office action, claims 1-5, 7, 8, 10, 24 and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Fukuda (Japanese Patent No. 57-159038 hereinafter Fukuda) in view of Lou et al. (U.S. Patent No. 5,872,045, herein after Lou) and Wolf and now in view of Hamanda (U.S. Patent No. 5,972,778).

The Examiner stated that Fukuda discloses a trench isolation structure in FIGS. 4a-4e of Fukuda which includes the elements of the present invention. The Examiner also stated that since shallow trench isolation regions extend below 5000-8000 angstroms as disclosed by Wolf, the present invention is obvious in view of the cited references. The Examiner cited Lou to show that polysilicon may be used to provide isolation and further cites Hamanda to teach that channel depths may extend between 200 to 1500 Angstroms.

Assuming that Fukuda teaches a structure having a trench filled with polysilicon and a nitride liner lining a lower portion of a trench, and further assuming that it is known in the art that channel depths are within a range of 200 to 1500 Angstroms, as taught by Hamanda, with shallow trenches extending below this as taught by Wolf and still further assuming that oxide and polysilicon are equivalent trench fill materials, as taught by Lou, the Applicant believes that the present invention as claimed is not disclosed or suggested by these references. These references, when combined, do not teach or suggest to anyone skilled in the art, the benefits of extending a depth of a nitride liner of a shallow trench isolation region just below a channel depth. The Applicant believes that no motivation exists to combine these references and that one skilled in the art would not be motivated to combine these references to solve a hot carrier effect problem.

The Applicant's claims include, inter alia, a nitride liner recessed within a trench ... an uppermost surface of said nitride liner being disposed just below a transistor channel depth, Dc, of a transistor disposed in a well beside said shallow trench isolation structure, the recessed nitride liner being dimensioned and configured to prevent hot carrier effects due to charge trapping for charge which traverses a channel of the transistor. The depth of the uppermost surface of the nitride liner is a structural feature of the present invention which is not disclosed or suggested by the cited art of record.

The Examiner bares the burden of proof for showing all elements of a claim. The Examiner has not shown that the prior art teaches an uppermost surface of a nitride liner being disposed just below a transistor channel depth, D_c , of a transistor disposed in a well beside said shallow trench isolation structure, the recessed nitride liner being dimensioned and configured to prevent hot carrier effects due to charge trapping for charge which traverses a channel of the transistor. The Examiner has shown that a channel depth may be 200 to 1500 Angstroms, and that a shallow trench may extend below this (5000-8000 Angstroms). But, the Examiner has not show a nitride liner having an uppermost surface just below a channel depth. The functional language of the claims of the present invention further clarifies the invention and provides the motivation to provide such a novel structure. The critical nature of this placement is believed to be sufficiently set forth in the specification and claims. The present invention performs differently than the prior art, namely by eliminating hot carrier effects. The selection of the nitride liner position is not merely a design choice. The placement of the nitride liner is based on an important discovery made by the present inventors.

The Examiner contends that one skilled in the art would be able to select any depth of the uppermost surface as a matter of design choice. But, the present invention is not mere design choice, and instead provides a specific structural feature which solves hot carrier effect problems. This structural feature of the depth of the nitride liner is not disclosed or suggested by any of the cited references. Even Fukuda, which does not even show or describe a transistor, does not provide any guidance to one skilled in the art as to where to place the uppermost surface of the liner. The Applicant has discovered a way to relieve hot carrier effects and reduce power consumption in transistor devices. The importance of the placement of a nitride liner is disclosed only by the present invention and not by the references cited by the Examiner. The cited references do not alone or in combination teach or suggest the placement of an uppermost surface to reduce hot carrier effects.

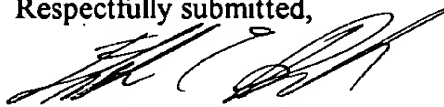
The functional language is given no weight by the Examiner. It is again respectfully submitted that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus if the prior art apparatus teaches all the structural limitations of the claim. *Ex Parte Mashum*, 2 USPQ 2d 1647, 1987. This means that a claim may be differentiated by functional language if the prior art device(s)

do not teach all of the structural limitations. Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is any structural difference. *In re Ruskin*, 347 F.2d 843, 1965. It is respectfully submitted, that the uppermost surface of the nitride liner and where it is placed is **structural**. The liner is dimensioned and configured to prevent hot carrier effects due to charge trapping. Further, a transistor depth, Dc is a limitation for the uppermost surface of the nitride liner which is not disclosed or suggested by the prior art references. This structure is not disclosed or suggested by the prior art references, either alone or in combination. The Applicant believes that the structural limitations of the claims are sufficient to overcome the rejection. In addition, the Applicant believes that the functional language of claims 1 and 24 should be given at least some patentable weight in view of the *Ex Parte Mashum* decision. The Examiner is respectfully asked to reconsider his rejection.

The afore-mentioned fundamental differences between Fukuda, Lou, Wolf and now Hamanda and the presently claimed invention provide sufficient basis to reverse this rejection and allow the claims of the present invention. The cited references either alone or in combination do not teach or suggest a shallow trench isolation including, *inter alia*, an uppermost surface of said nitride liner being disposed just below a transistor channel depth, Dc, of a transistor disposed in a well beside said shallow trench isolation structure, the recessed nitride liner being dimensioned and configured to prevent hot carrier effects due to charge trapping for charge which traverses a channel of the transistor. Accordingly, withdrawal of the rejection of claims 1-5, 7 and 24 and 25 is respectfully requested for at least the reasons stated.

In view of the foregoing amendments and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

Respectfully submitted,



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